

Research Article

Occupational Health Hazards and Needle Stick Injuries among Medical Laboratory Workers

Khadija Tahira¹, Khunsa Junaid², Hassan Ali³, Saira Afzal⁴, Rana Muhammad Ayub⁵, Amjad Khan⁶, Ali Akram Khan⁷, Muhammad Dawood⁸

¹Senior Medical Technologist, Department of Pathology, Shaukat Khanum Memorial Hospital, Lahore; ²PGR, Department of Community Medicine, King Edward Medical University, Lahore; ³Consultant Pathologist, Department of Pathology, Services Institute of Medical Sciences, Lahore; ⁴Professor & Chairperson, Department of Community Medicine, King Edward Medical University, Lahore; ⁵Associate Professor, Department of Economics and Business Management, University of Veterinary and Animal Sciences, Lahore; ⁶Assistant Professor, Department of Community Medicine, King Edward Medical University, Lahore; ⁷Demonstrator, Department of Community Medicine, King Edward Medical University, Lahore; ⁸PGR, Department of Community Medicine, King Edward Medical University, Lahore

Abstract

Background: Although all healthcare employees are open to work-related injuries but medical laboratory workers are more exposed to blood and other possibly contagious items are at greater risk of developing various blood borne infections. Recognizing frequency and context of contact to blood and bloodborne pathogens might be aid in developing policies for prevention.

Objectives: to find the frequency and types of occupational health hazards along with needle stick damages in medical laboratory employees in Lahore, Pakistan.

Methodology: Hospital based, analytical cross-sectional study was done from November 2018 to January 2019. A total of 217 medical laboratory personnel were enrolled by non-probability convenience sampling. Pre-tested self-administered questionnaire was used for data collection. Absolute number with percentage was used to present the descriptive data while to determine the statistical association between associated factors and occupational exposure, chi-square analysis was used. A p value of < 0.05 was considered as statistical significant.

Results: A total 217 medical laboratory workers were made part of the study with the mean age of contributors was 36.1 years (± 10.0 years). About 94 (46.8%) of medical laboratory workers gave history of needle prick. 57 (28.4%) respondents were open to non-biological hazardous material, while 37 (18.4%) became exposed to natural/organic dangerous substances and about 16 (8%) participants had exposure to both natural and non-natural risks. The most common cause of work-related injuries reported in the medical laboratory workers was ergonomics risk elements (23 including errors, tours, crowded working environment and workroom. Type of hospitals, job category and experience were statistically significantly associated with needle stick injury.

Conclusion: The present research represented high proportion of various types of occupational hazards. Needle stick injuries and exposure of HBC and HCV infection were quite common among laboratory workers. Therefore, there should be monitoring system which could be offered correct information regarding occupational hazards and needle stick injury. Pertinent stakeholders need to develop policies to make a encouraging working environment and enhance their devotion to worldwide safety measures.

Corresponding Author | Dr. Khadija Tahira, Senior Medical Technologist, Department of Pathology, Shaukat Khanum Memorial Hospital, Lahore. E-mail: kudajatahira@gmail.com

Keywords | Occupational hazards, Medical Laboratory workers, Needle stick injury

Introduction

While working, laboratory workers can experience a wide range of occupational hazards depending upon the material they utilize and the methods used to perform various tests.¹ The World health organization defines health hazard as any damage, loss of services and livelihood or disruption to social, economic or environment aspects of life due to harmful conditions, activities, phenomenon or substances.² In an estimate by International Labor Organization, 160 million people from the work force suffer disease related to work like mental health issues and musculoskeletal problems, whereas 270 million work related accidents cause 350,000 casualties; occupational hazards can be attributed to the over two million work related deaths.³ The WHO reports very similar finding and estimates the cases of worldwide occupational diseases to be 217 million.⁴ Although many countries have witnessed improvements in occupational health, it still is not the top priority in many developing countries and other health issues have competed with it. Occupational health is not prioritized in developing countries due to certain socio-economic, political and cultural challenges.⁵ This has resulted in occupational health to remain neglected in such developing countries and thus affecting the wellbeing of workers.^{6,7} There are no adequate laws and policies for work environment to protect the workers from life threatening hazards. Occupational health and safety laws are present only for around 10% of the population of the developing countries omitting many industries posing health hazards like the health sector.⁸

Managing healthcare waste poses a great risk to healthcare in the developing countries. Medical waste like sharps, needles, devices, blood and body tissues if not properly handled, collected, segregated and disposed off, can cause health hazards.⁹ Healthcare workers who do not follow standard precautionary measures like hand washing, use of gloves and personal protective equipment are largely responsible for increase in occupational health hazards. This not only increases the risk of injuries, but also increases the risk of transmission of life threatening infections in health care workers. HCWs are exposed to sharp injuries when instruments like needles penetrate the skin of the subject. A sharp instrument contaminated

with blood and body fluids can potentially transmit infection.^{6,7,8} Each year, more than 35 million health-care workers globally get exposed to needle stick and sharp injuries. Out of more than twenty blood borne pathogens that can be transmitted by such injuries, the most dangerous and life frightening are Human Immunodeficiency Virus (HIV), Hepatitis B and Hepatitis C.^{8,9} According to Pakistan Economic Survey 2013-14, Pakistan has the 10th largest workforce in the world and 67.5% of its population is rural with agriculture being the predominant profession.¹⁰ A study conducted in Pakistan showed that the commonest health hazard was needle stick injury 58.99% while other injuries accounted for 38.25% of the health hazards.¹¹ Laboratory workers need appropriate defensive actions to diminish threat of disease transmission as they are constantly being exposed to infections. There is scarce data about the occupational health hazards and needle stick injuries in laboratory workers in Pakistan. Thus this study aims to find important associated risk factors and different types of occupational hazards including needle stick injuries among laboratory workers in Lahore, Pakistan; thus providing ground to formulate strategies to address the occupational health hazards among laboratory workers at their workplace. This in turn can influence policy makers to devise effective strategies and laws to improve work environment for medical laboratory workers and reduce occupational health hazards.

Methods

The study utilized quantitative data collection method and was cross-sectional in nature. It was conducted in Lahore that is 2nd largest urban area of Pakistan with nearly 11,126,285 population of which 52.35% are male, and remaining 47.64% are females.¹² Nine major hospitals were selected and the selection of hospital includes a combination of government as well as private hospital. Non-probability convenience sampling technique was employed for data collection. The study population was males and females medical laboratory employees waged in particular healthcare laboratories in Lahore, Pakistan. The medical laboratory personnel employed in various laboratories of hospitals of age ≥ 24 years, capable to interpret Pakistan's inborn language Urdu (National language of Pakistan) or English,

soundness of mind, and willingly readiness were made part of research. It consisted of medical laboratory scientists, laboratory operators, laboratory assistants, phlebotomist and pathologists employed in hospitals in numerous units like biochemistry, hematology, microbiology, blood bank, molecular biology, histopathology and phlebotomy.

For assessing single population proportion, the formula ($n = \frac{z^2pq}{d^2}$) was utilized for sample size calculation¹³. A sample size of 217 was obtained at a 95% confidence level; prevalence of 83.0%¹⁴ with the allowable margin of error of 5%. For data collection, a pre-coded, pretested, close-ended interview questionnaire was made in English language after reviewing various published articles on occupational hazards. The questionnaire had sections on sociodemographic characteristics of respondents, types and causes of occupational hazards and pin prick hazard in medical laboratory personnel. The study was approved by Ethical Review Board of University of the Punjab, Lahore and written consent was taken from hospital management and in-charges of units.

First of all, all questionnaires data were checked for any errors and if mistakes were found immediately removed and corrected. The data was then transferred to SPSS version 25 for analysis. Continuous data were tabulated in mean and standard deviation while categorical variables were calculated as percentages. Results were also expressed into frequencies and tables respectively. Chi square (χ^2) was used for analyzing the association between selected socio-demographic characteristics and outcome variable and the level of significance at $< 5\%$ was considered statistically significant.

Results

The mean age of respondents was 36.1 years (± 10.0 years). The participants were mostly male (70.6%), had bachelor degree qualifications (38.3%) and had salary more than 60,000 rupees per month. The respondents mostly had 1-05 years of experience (38.8%), had training on biosafety (45.3%) and mostly were married (67.7%) (Table 1).

Regarding exposure of occupational hazards, more than half of the respondents (54.7%) experienced occupational hazards. Among these, 28.4% expe-

rienced injuries from un-natural or synthetic (non-biological) material while 18.4% suffered pricks from natural substances (biological). Among biological hazards, (10.4%) of respondents were exposed to HBV infection. (10.4%) participants of study faced

Table 1: Socio-Demographic Characteristics of Medical Laboratory Professionals at different Hospitals of Lahore (N=217)

Variables	Description	N	%
Gender	Male	153	70.6
	Female	64	29.4
Age	<45	159	79.1
	>45	42	20.9
Education	Secondary	33	16.4
	Diploma 1yr MLT	45	22.4
	Graduation	77	38.3
	Higher education	46	22.9
Income	20,000-30,000	46	22.9
	30,000-40,000	40	19.9
	40,000-50,000	25	12.4
	50,000-60,000	23	11.4
	>60,000	67	33.3
Experience (Years)	01-05	78	38.8
	06-10	45	22.4
	11-15	23	11.4
	16-20	12	6.0
	21 and >21	43	21.4
Section	Biochemistry	50	24.9
	Microbiology	53	26.4
	Molecular biology	9	4.5
	Hematology	36	17.9
	Histopathology	30	14.9
	Blood bank	9	4.5
	Phlebotomy	8	4.0
	Emergency	6	3.0
Job category	Clinical lab scientist	62	30.8
	Clinical lab technician	72	35.8
	Clinical lab attendant	18	9.0
	Phlebotomist	7	3.5
	Pathologist	42	20.9
Training on biosafety	Yes	91	45.3
	No	110	54.7
Professional education	Yes	132	65.7
	No	69	34.3
Marital status	Single	65	32.3
	Married	136	67.7

stress while 15(7.5%) suffered from back pain respectively (Table 2)

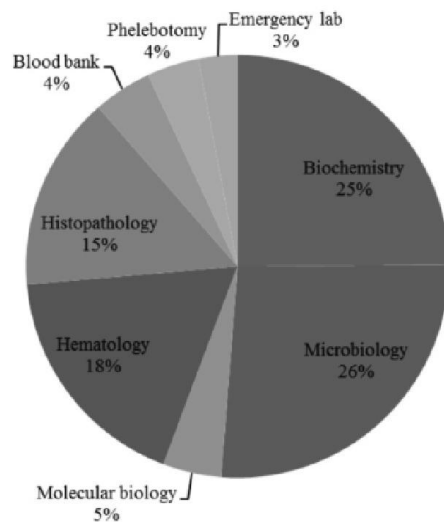


Figure 1 Percentage Distributions of Respondents by Section

Table 2: Occupational Hazards Experienced by Laboratory Workers in Major Hospitals in Lahore, Pakistan

Hazards experienced by laboratory workers	Frequency (217) N (%)
Biological hazards	18.4
Exposure to HBV infection	21(10.4)
Exposure to HCV infection	17 (9.0)
Exposure to tuberculosis infection	8 (4.0)
Exposure to chicken pox, bacterial, parasitic or fungal infection	6 (3.0)
Non-biological hazards	28.4
Stress	21(10.4)
Back pain	15 (7.5)
Physical hazards (noise,radiation,vibration, heat and cold)	13 (6.5)
Chemical hazards (Vapors, fumes, acids and spills)	13 (6.5)
Stress and back pain	9 (4.5)
Others (Musculoskeletal injuries and Slips, trips, and/or falls)	1 (1.0)

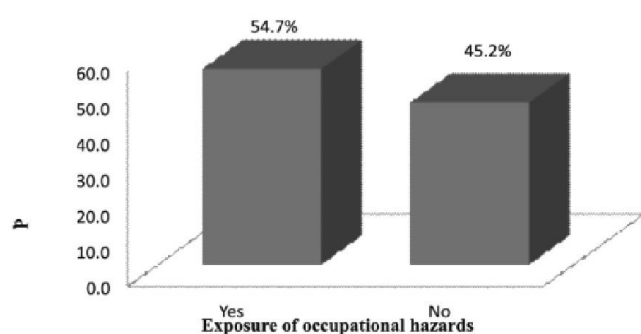


Figure 2 Percentage Distributions of Occupational Hazards by Respondents

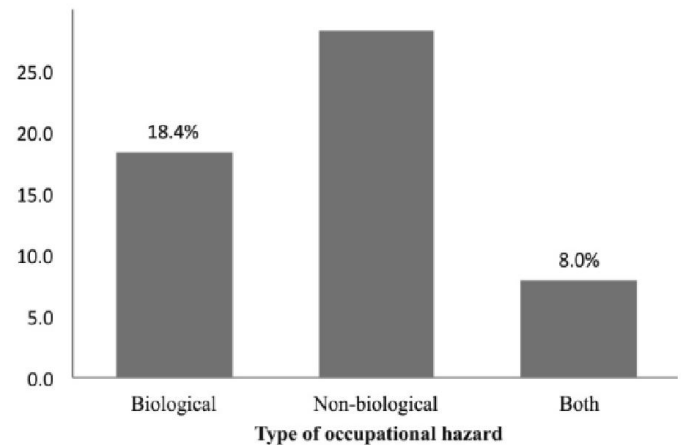


Figure 3 Percentage Distributions of Type of Occupational Hazards by Respondents

Regarding causes of occupational hazards, it was found that ergonomics risk (23%) such as mistakes, excursions, overfilled employment area and hazar-dously located laboratory apparatus were common causes of work-related injuries in the medical laboratory employees(Figure 4).

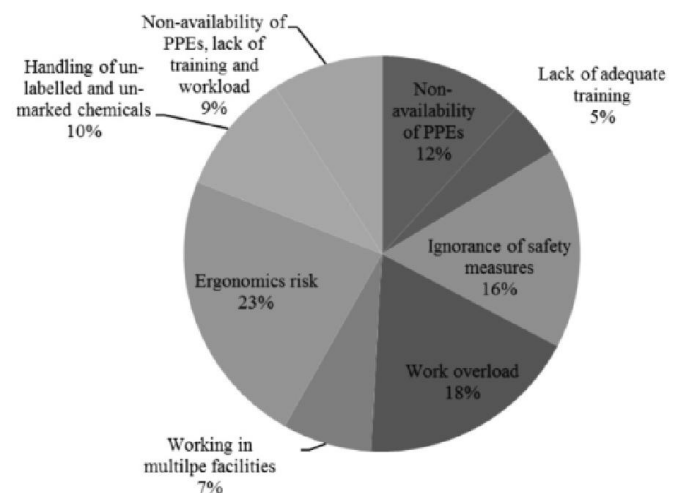


Figure 4 Percentage Distributions of Causes of Occupational Hazards by Respondents

Regarding injury by pin prick, (46.8%) participants reported to have experienced this hazard. Of these about (13.2%) of participants suffered from this injury for two-times and about 22 (10.9%) experienced this injury for one time only (Table 3).

With respect to associated factors, type of hospital ($p=0.025$), job category (0.003) and years of experience (0.012) were statistically significantly associated with history of needle stick injury (Table 4).

Table 3: Frequency of Needle Stick Injury among Medical Laboratory Professionals (N=201)

Needle Stick Injury		N	%
History	No	107	53.2
	Yes	94	46.8
How many times experienced	No	107	53.2
	Once	22	10.9
	Twice	27	13.2
	More than two	45	22.4
Safety measures taken	No	42	20.9
	Yes	52	25.9
Do you report NSI?	No	58	28.9
	Yes	36	17.9

Table 4: Association of Needle Stick Injury with Respect to Socio-Demographic Characteristics (N=217)

Characteristics	NSI history		X2	p-value
Hospitals	No	Yes	7.85	.025
Public	41	51		
Semi govt.	29	26		
Private	37	17		
Job category			16.006	.003
Clinical lab scientist	45	17		
Clinical lab technicians	29	43		
Clinical lab attendant	11	7		
Phlebotomist	3	4		
Pathologist	19	23		
Experience (Years)			12.8	.012
01-05	49	29		
06-10	26	19		
11-15	5	18		
16-20	6	6		
21 and >21	21	22		
Training on biosafety				.075
No	53	57		
Yes	54	37		

Discussion

The present study results showed that mean age of participants was 36.1 years (± 10.0 years). 70.1% of them were < 45 years of age and males made the majority of research population i.e. 70.6%. Maximum of the participants (38.8%) had an experience of lab. Work for 1-5. Majority of the participants (38.3%) had completed their graduation, were married.^{11,14-17} This discrepancy in the socio demographic data might be due to the more focused on the specific category of the the laboratory workers working in the pathology laboratory. The present research concluded that, greater than 50% of participants (54.7%) experienced occupa-

tional hazards and among these, 28.4% experienced injuries from synthetic (non-biological) material while 18.4% had these from natural (biological) substances. The predictors of biological hazards were exposure to hepatitis B infection and hepatitis C infection and while for nonbiological hazards were stress, having back pain respectively. The most shared reason of work-related injuries in the medical laboratory personnel was ergonomics hazard (23%) that may be in form of errors, excursions, crowded working environment and hazardous placement of laboratory apparatus. The second most shared reason found in the present research was overburden of work(18%). These results are comparable with those on work-related injuries in health employees in Kampala.^{16,18,19}

The result of present study showed that 46.8% of respondents had suffered pin-prick once during working in laboratory. In the similar studies, different rates of needle stick injury have been reported in various countries (such as 55%, 39%, and 41%).^{20,21,22} The result of the current study showed that only 22.4% of participants had pin-prick damages more than twice during their work involvement, only 25.9% observed the protective safety measures after the getting a pin-prick and only 17.9% report needle stick injury.^{23,24,25} It appear that the reporting rate of needle stick injuries as well as adopting safety measures laboratory personnel in the current study was low which may be because of the lack of employees' awareness or knowledge regarding necessity for reporting and adopting safety measures. This pointed out results revealed the necessitate for refining the type and amount of safety training among laboratory workers which thus decrease the frequency of injuries and related transmitted diseases.

The result of present study revealed that needle stick injuries were statistically significantly associated with the type of hospital ($p=0.025$), job category (0.003) and years of experience (0.012) were statistically significantly associated with history of pin-prick.^{25,24} This can be because of the reason that laboratory workers working in various types hospitals, having different job categories and longer duration of services are more exposed to occupational hazards and thus further NSI among more experienced. Laboratory safety guidelines should be demonstrated to diminish the risks in a laboratory working area.

The findings of the study may be affected by recall bias as the requisite data were gathered via asking questions from the study participants since they may not be able to flamboyantly recall their past experience of needle stick injury. Due to use of cross-sectional design of research, causative relationships were extremely challenging to be established. The major strength of this study lies in the fact that it is the

first ever to determine the causes and types of occupational hazards as well as needle stick injury and associated factors in the area of present research. Moreover inclusion and coverage of both private and community laboratories of the area made the research illustrative.

Conclusion

The present study reported high frequency of various types of occupational hazards and pin-prick hurts in laboratory personnel of Lahore, Pakistan. In order to decrease the hazard of occupational health infections, strict execution of biohazard strategies in the health care environment and observation of needle stick avoidance strategies are suggested. The ministry of health and health professionals associations should generate awareness on health professionals on safety measures and training employees particularly the employees of laboratory workers.

Ethical Approval: Given

Conflict of Interest: The authors declare no conflict of interest

Funding Source: None

References

- Harrington J, Shannon H. Survey of safety and health care in British medical laboratories. *BMJ*. 1977; 1(6061):626-628.
- Owie HO, Apanga PA. Occupational Health Hazards Prevailing among Healthcare Workers in Developing Countries. *JAIDS Clin Res*. 2016; 7(1):596.
- International Labour Organization. International Labour Standards on occupational safety and health. 2016.
- World Health Organization. International statistical classification of diseases and related health problems (ICD-10) in occupational health. Geneva: World Health Organization. 2016.
- Ahmad I, Sattar A, Nawaz A. Occupational health and safety in industries in developing world. *Gomal J Med Sci*. 2016; 14(1):223-8
- Ncube F, Kanda A. Current Status and the Future of Occupational Safety and Health Legislation in Low- and Middle-Income Countries. *Safety and work*. 2018;9(1):365-371
- Ndu AA, Arinze-Onyia SU. Standard precaution knowledge and adherence: Do doctors differ from medical laboratory scientists? *Malawi Med J*. 2017; 29(4):294-300.
- Sriram S. Study of needle stick injuries among healthcare providers: Evidence from a teaching hospital in India. *J Family Med Prim Care*. 2019; 8(2): 599–603.
- Spruce L. Back to Basics: Sharps Safety. *AORN J*. 2016; 104(1):30–6.
- Ministry of Finance of Pakistan. Population, labour force and employment. [Updated on 2019 November 30; cited 2019 December 5]. Available from from: http://finance.gov.pk/survey/chapters_14/12_Population.pdf
- Ahmad H, Kousar A, Altaf J. Occupational Hazards in Pathology Laboratories. *JRMC*. 2016; 20(1):52-56.
- Pakistan bureau statistics. Population Census. [Updated on 2018 January 3; cited 2018 November 2]. Available from <http://www.pbs.gov.pk/content/population-census>.
- Naing L, Winn T, Rusli BN. Practical issues in calculating the sample size for prevalence studies. *Arch Orofac Sci*. 2006; 1(1):9–14.
- Aluko OO, Adebayo AE, Adebisi TF, Ewegbemi MK, Abidoye AT, Popoola BF. Knowledge, attitudes and perceptions of occupational hazards and safety practices in Nigerian healthcare workers. *BMC Res Notes*. 2016; 9(1):71.
- Osungbemi B, Adejumo O, Akinbodewa A, Adelosoye A. Assessment of Occupational Health Safety and Hazard among Government Health Workers in Ondo City, Southwest Nigeria. *Br J Med Med Res*. 2015; 13(8): 1-8.
- Tait FN, Mburu C, Gikunju J. Occupational safety and health status of medical laboratories in Kajiado County, Kenya. *PAMJ*. 2018; 29(1): 1-17.
- Netto E, Hamedon T R. Predictors Of Knowledge, Attitude And Practices On Work Related Injuries Among Laboratory Staffs In A Public University In Malaysia. *IJPHCS*. 2017; 4(5): 139-157.
- Ndejjo R, Musinguzi G, Yu X, Buregyeya E, Musoke D, Wang JS, et al. Occupational health hazards among healthcare workers in Kampala, Uganda. *J Environ Public Health*. 2015; 1(1):913741.
- Rajan D. Occupational Hazards and Health: A Comparative Study among Medical Laboratory Technicians. *IJRASET*. 2014;2(3):305-315.
- Pervaiz M, Gilbert R, Ali N. The Prevalence and Underreporting of Needlestick Injuries among Dental Healthcare Workers in Pakistan: A Systematic Review. *Int J Dent*. 2018;1(1):1-14.
- Tabatabaei S, Behmanesh Pour F, Ordoni Avval J, Osmani S, Mokhtari S, Aghebat Bekheyr M. Occupational Exposure to Blood and Other Body Fluids Among Healthcare Workers in Three Teaching Hospitals, Southeast Iran. *Int J Infect*. 2016;3(3).2-6.
- Sriram S. Study of needle stick injuries among healthcare providers: Evidence from a teaching hospital in India. *J Family Med Prim Care*. 2019; 8(2): 599–603.
- Khabour OF, Al Ali KH, Mahallawi WH. Occupational infection and needle stick injury among clinical laboratory workers in Al-Madinah city, Saudi Arabia. *J Occup Med Toxicol*. 2018; 13(1):15.
- Amini M, Behzadnia MJ, Saboori F, Bahadori M, Ravangard R. Needle-Stick Injuries Among Healthcare Workers in a Teaching Hospital. *Trauma Mon*. 2015; 20(4):e18829.
- Kebede A, Gerensea H. Prevalence of needle stick injury and its associated factors among nurses working in public hospitals of Dessie town, Northeast Ethiopia, 2016. *BMC Res Notes*. 2018; 11(1):413.